

STATEMENT OF WORK FOR SYSTEM INTEGRATION OF A STIRLING RADIOISOTOPE POWER SYSTEM

INTRODUCTION

This Statement of Work (SOW) is for a three phase effort to design, develop, fabricate and qualify a Stirling Radioisotope Power System (SRPS) for use on potential National Aeronautics and Space Administration (NASA) space exploration missions. The Phase I effort will be focused on preparing a conceptual SRPS design that would become the reference design for development in Phases II and III. As a part of this conceptual design phase, the contractor will also prepare a detailed technical and cost proposal for the subsequent phases. The decision on whether to proceed with Phase II will be based on an analysis and evaluation of both the conceptual design and the detailed cost and technical proposal.

Phase II will include efforts related to the final design, development and qualification of the complete power system. It will include related safety analysis to assess the potential mission risks that would be involved in the use of the system. It will also include development of test procedures and oversight of fueled qualification testing that will be conducted by the Department of Energy (DOE)/Mound personnel at the DOE fueling and test facility at the Mound Plant in Miamisburg, Ohio. Testing using an electrical heat source would be conducted at the contractor's facility.

Phase III, will include efforts related to the fabrication, testing and integration of the flight power systems for use on actual missions. This phase would include the final safety analysis related to specific missions and required power system support at the launch site at the time of launch.

For planning purposes, there is a potential for up to two launches, one in January 2006 and one in February 2007. The launches are assumed to be from the Kennedy Space Center/Cape Canaveral Air Station (KSC/CCAS) and are assumed to be on either a Delta IV or Atlas V launch vehicle. Additional information on specific missions, launch dates or launch vehicles will be provided, if available, at the time the Phase I contract effort begins. As new mission related information becomes available during Phases II and III, the contract will be modified as required. For planning purposes, include provisions for conducting nuclear risk safety assessments supporting NEPA and interagency launch approval processes for each of the mission launches.

The Stirling Radioisotope Power System described in this Statement of Work assumes the use of a 55 W_e Technology Demonstration Convertor (TDC) manufactured by Stirling Technology Company (STC). During Phase I, interfaces with STC will be coordinated through the Department of Energy. During Phases II and III, STC would become a subcontractor to the System Integration Contractor carrying out this scope of work.

The System Integration Contractor will be responsible for the performance of the overall Stirling Radioisotope Power System, including the Stirling convertor, the electrical controller and support of the integration of the General Purpose Heat Source (GPHS) into the overall power system at the DOE Mound facility. The SRPS design will be based on the existing GPHS modules that have been qualified and used in previous space missions. Any GPHS units required for qualification testing or for flight units, including the Pu-238 contained in them, will be provided by DOE. Specifications and performance requirements for the electrical controller will be the responsibility of the System Integration Contractor, though actual development and fabrication during Phases II and III may be accomplished under separate contract. Testing of the controller as part of overall system testing to verify system performance will be conducted by the System Integration Contractor.

SCOPE

1.0 PHASE I SRPS CONCEPTUAL DESIGN AND PLANNING

TASK 1.1 Conceptual Design

The Contractor shall develop a conceptual design for a Stirling Radioisotope Power System (SRPS). The design should be based on the 55 W_e Technology Demonstration Converter (TDC) manufactured by Stirling Technology Company (STC). The design should also be based on the use of General Purpose Heat Source (GPHS) modules developed and used on previous space missions. All other design features (structural materials, configuration, radiator concepts, insulation, electrical controller, etc.) will be the responsibility of the contractor to define and integrate into an overall power system. As appropriate, the contractor can consider specific components such as pressure relief devices (PRDs) that were developed for previous Radioisotope Thermoelectric Generator (RTG) applications.

In preparing this conceptual design, the contractor shall consider manufacturing, assembly, testing, quality assurance, handling, shipping, fueling, systems integration, safety and operational issues for the SRPS from the start of manufacturing to the end of the mission. The conceptual design should be optimized to maximize system efficiency while minimizing overall system mass. -In meeting the overall power level goal identified below, the contractor should assume that at least two (with a maximum of three) separate SRPS's will be installed on the spacecraft. The contractor will determine the number of 55 W_e engines required to meet mission performance and reliability requirements.

The following goals are to be used for the conceptual design and for planning subsequent phases:

- End of Mission (EOM) power: 325 W_e dc after six years (out of the controller). In developing the conceptual design, the contractor must define any assumed rates of power system decay over the entire range of operations, including Pu-238 decay.
- Mass: SRPS should be as small and light as possible with a goal of maximizing specific power (W/kg) at EOM.
- Controller output operating voltage: $+ 28 \pm 0.2 V_{dc}$; Operating Range 23-36 V_{dc}.
- Max. current at terminals of controller: 12a
- Max. voltage at terminals of controller: 36 V_{dc}.

In designing the SRPS, the contractor shall take into consideration the power system structure, and spacecraft and launch vehicle features that could affect the integrity of the GPHS modules. The contractor shall analyze the system features and report their affect upon modules during potential accident scenarios. In this regard, the SRPS should not impede the free and clear release of the GPHS modules during inadvertent reentry of an SRPS into the earth=s atmosphere.

The SRPS conceptual design must consider several other parameters.

- C The SRPS must survive a radiation dose of 4Mrads (Si) through 100 mils of aluminum over the total mission.
- C The SRPS must also be designed to produce not less than 80% of nominal power during launch, returning to 100% of nominal power within 30 seconds.
- C No credible single point failure shall cause loss of more than 10% of SRPS output power. All credible single point failures shall be identified and justified. (Waiver of this requirement may be allowed if justified.)
- C The overall size of the SRPS must be such that it will fit within the maximum acceptable envelope for the DOE shipping container (USA/9904/B(U)-F-85 Radioisotope Thermoelectric Generator Package) that is used to transport the fueled systems. The SRPS must also fit through the fairing doors at the launch complex (estimated to be 121.9 cm x 152.4 cm (48"x60")).
- C The SRPS must be designed to withstand dynamic loads that could occur during launch. These will be specified by the time contract is executed.
- C The SRPS must be designed to EMI/EMC Standard 461C and meet magnetics requirements of 25nT at 1 meter.
- C The SRPS must be designed to minimize microphonics to a level of ≤ 35 N-m at 1 meter moment arm.

During the preparation of the conceptual design, the contractor shall conduct two oral design reviews. The first will be midway through the conceptual design phase and the second will be to present the final conceptual design. In addition, the contractor shall submit a Conceptual Design Package that summarizes the key features and assumptions. The package shall also describe and demonstrate the contractor's ability to support, through analysis and reporting, the NEPA and interagency launch approval processes for the NASA missions. This Conceptual Design Package will include a preliminary specification for the controller that could be applied if the controller is to be developed under a separate contract.

Weekly or monthly telephone conferences will be held with the DOE program manager and appropriate NASA/JPL personnel as appropriate. The DOE program manager along with interested NASA/JPL individuals may visit the contractor's site on a monthly basis. The contractor may, if required, visit the DOE facilities that would be involved in the fabrication of the GPHS modules or the assembly and testing of the fueled power system.

Task 1.2 Planning and Proposals for Phases II and III

The contractor shall develop a detailed Phase II/III written cost and technical proposal based on the description of Phase II/III activities set forth under the headings Phase II SRPS Design, Development, Demonstration and Qualification and Phase III Flight

Program. This written proposal shall include a Stirling Convertor Preliminary Development Plan that describes a program to evaluate and demonstrate that the Stirling convertor is flight qualified. It shall also include a development plan for all other aspects of the Stirling Radioisotope Power System, including life testing and analysis. The plan shall demonstrate a capability to complete the safety analyses required for the mission NEPA and interagency launch approval processes. An oral presentation summarizing the Phase II/III proposal will be made as part of the final conceptual design review discussed in Task 1.1 above.

To guide the contractor in the preparation of this proposal, Attachment IIB lists an initial set of contract deliverables that will form the basis of establishing projected costs for phases II and III.

2.0 PHASE II SRPS DESIGN, DEVELOPMENT, DEMONSTRATION AND QUALIFICATION

In Phase II, the contractor shall design, develop, fabricate and test an engineering SRPS and a qualification SRPS which meet mission requirements. Mission requirements shall be developed with the Jet Propulsion Laboratory (JPL) and, as necessary, with inputs from the launch site. As part of this effort, the contractor shall also complete development, demonstration, and qualification of the Stirling convertor.

The contractor shall also prepare a preliminary safety assessment and support safety documentation for the NEPA and launch approval processes for potential NASA missions. In preparing the safety analysis reports associated with this RFP, the contractor shall use DOE Order 5480.23, 4-10-92, Subject: Nuclear Safety Analysis Report as guidance in preparing safety analysis reports for the interagency safety review process.

The contractor shall prepare a preliminary safety test plan describing specific safety tests and required safety test hardware.

This Phase II effort shall result in a final SRPS design that has been tested to flight qualification levels and meets mission requirements. A more detailed description of the Phase II work scope is given below.

TASK 2.1 Mission Requirements Development, Spacecraft Integration and JPL/Launch Site Liaison

The contractor shall support integration of the SRPS designs and performance parameters with the NASA/JPL spacecraft and launch vehicle by providing SRPS information and data including drawings and associated documents. The contractor shall conduct integration efforts with JPL in developing the SRPS mission requirements documents and interface drawings. These documents shall define the baseline NASA mission requirements for SRPS including power, weight, size, and environments. The contractor shall provide the lead in coordinating these requirements. Once agreement is reached with JPL, the contractor will provide a recommendation to DOE for approval. The contractor shall conduct analytical studies and use test data where appropriate to assure that the SRPS is properly integrated to the NASA spacecraft and launch vehicle per the SRPS specification. The contractor shall provide support for various SRPS integration and interface meetings to assure proper integration and to provide JPL with production status, safety, technical, and launch readiness information.

TASK 2.1.1 Requirements Documents Support

The contractor shall provide engineering support including analyses related to the integration of the SRPS with the spacecraft, and other liaison activities. The contractor shall perform analyses and tradeoffs in response to questions and requests from JPL, as required and directed by DOE. The type of analyses conducted will include, as necessary, structural, mechanical, thermal, magnetic, radiation, meteoroid, and electrical performance.

TASK 2.1.2 Interface Meetings and Reviews

The contractor shall support DOE through attendance at various meetings to be held at JPL and other NASA and contractor facilities and shall work with JPL to assure that the SRPS Acceptance Test Plan provides the required data to satisfy (1) the imposed environment and testing conditions, (2) SRPS requirements, and (3) the Interface Control Drawing.

TASK 2.2 Stirling Convertor Development and Performance Demonstration and Qualification

This activity is to demonstrate that the Stirling convertor is flight qualified for use in a SRPS. Based on the technical readiness assessment and preliminary development plan developed in Phase I, finalize and implement the development plan to demonstrate, through testing and/or analyses, the flight readiness of the Stirling convertor. The plan's scope shall be coordinated with ongoing or planned activities at STC and NASA Glenn Research Center. Such factors as reliability, life, and performance should be analyzed, tested, and documented. A formal flight technical readiness review shall be conducted which addresses all factors concerning the convertor's readiness for use as a flight qualified component on a NASA mission.

TASK 2.3 Controller Specification and Integration

A controller may be supplied as GFE. DOE will make a determination on the status of the controller supplier prior to the start of the Phase II/Phase III contract award. Based on the preliminary controller specification developed in Phase I, the contractor in coordination with the controller supplier shall finalize and issue the controller specification. The contractor shall develop a plan to perform performance and acceptance testing of the controller. The contractor shall conduct in coordination with the supplier a formal flight readiness review of the controller to be used in Phase III of the contract. The contractor shall maintain cognizance of the controller development.

TASK 2.4 SRPS Design and Analysis

The contractor shall provide the engineering, analysis, and planning activities as required to ensure the fabrication, assembly, testing and delivery of flight qualified SRPSs. The contractor shall also provide the management and technical liaison with Government agencies, as necessary, to integrate the GPHS heat sources and Stirling convertor, and to support the fueling and system integration testing of the qualification SRPS.

The contractor shall prepare SRPS Specifications to meet the mission requirements developed under Tasks 2.1, 2.1.1 and 2.1.2. The requirements baseline for the design reviews and updating of drawings shall be the Requirements Documentation developed under Task 2.1, 2.1.1 and 2.1.2. These specifications shall be part of the design packages submitted to DOE for approval.

The contractor shall develop Environmental Criteria and Test Requirements for the SRPS for potential NASA missions based on the mission requirements developed under tasks 2.1, 2.1.1 and 2.1.2. The Environmental Criteria and Test Requirements document shall be submitted to DOE for approval.

The contractor shall prepare a Qualification Test Plan and Qualification Test Report indicating by specific requirements that the SRPS is qualified to meet the SRPS specifications and environmental criteria and test requirements. Summary tables shall be included in the report listing all the specific requirements, qualification criteria, and verification that the SRPS meets the requirement criteria, and supporting comments.

The contractor shall maintain control of SRPS documentation. The contractor shall submit the SRPS design drawings to DOE for review and approval.

The contractor shall develop SRPS processing plans, procedures and revisions as necessary. The contractor shall submit these plans and detailed procedures as part of the design package submitted to DOE for review and approval.

The contractor shall prepare SRPS handling and operating procedures, integration plans and revisions as necessary to meet DOE requirements. The contractor shall submit these procedures as part of the final design packages submitted to DOE for review and approval.

The contractor shall prepare detailed fueling and test plans to be approved by DOE for SRPS fueling and qualification testing at the DOE Mound fueling and test facility. The DOE fueling and test facility will provide input to the contractor for these plans. Fueling and qualification testing procedures will be prepared by the DOE fueling and test facility, approved by the contractor and DOE Headquarters.

TASK 2.4.1 Preliminary SRPS Design

The contractor shall develop a preliminary design for a SRPS based on the approved Phase I conceptual design that meets the mission requirements developed under tasks 2.1, 2.1.1 and 2.1.2. The contractor shall prepare a preliminary design review package at the completion of the preliminary SRPS design.

TASK 2.4.2 Final SRPS Design

The contractor shall develop a final design for a SRPS based on the approved preliminary design that meets the mission requirements developed under tasks 2.1, 2.1.1, and 2.1.2. The contractor shall prepare a final design review package at the completion of the final SRPS design.

TASK 2.5 SRPS Fabrication and Testing

The SRPS Phase II program will include the fabrication and testing of an engineering SRPS, a qualification SRPS and appropriate mass, thermal, fit up and safety simulation models.

An engineering SRPS shall be constructed to be used in development and engineering evaluations. The engineering SRPS should be functional and in general represent the proposed flight configuration.

A qualification SRPS shall be constructed that will be used prove out the flight configuration and formally qualify the system design. The qualification SRPS will require a high level of quality assurance normally associated with flight systems.

A mass model shall be constructed that provides the mass properties of a flight system (e.g., center of gravity). The mass model could be constructed to also function as a fit-up model. A fit-up model would provide a configuration that would allow all of the SRPS/spacecraft attachment points to be accurately represented.

A thermal model shall be constructed that provides a non-operational simulation of the thermal properties (e.g., surface temperatures) of the flight SRPS.

Safety simulation models shall be constructed as required to be used in various safety evaluation tests. The safety simulation models will be non-operational and should be representative of the flight SRPS configuration.

TASK 2.5.1 Engineering SRPS Fabrication and Testing

The contractor shall assemble, process and performance test one engineering SRPS with an electrical heater. This will include providing the facilities, equipment and materials necessary for the development, fabrication and test of this engineering SRPS. It will also include the actual fabrication, assembly and inspection of the hardware and tooling for all SRPS parts and subassemblies in accordance with appropriate quality procedures and requirements.

TASK 2.5.2 Qualification SRPS Fabrication and Testing

The contractor shall assemble and test with an electrical heater one qualification SRPS. This will include providing the facilities, equipment and materials necessary for the fabrication and testing of the unit. It will also include the required inspections in accordance with appropriate quality procedures and requirements.

The contractor shall develop a qualification test plan for the testing of the fueled qualification SRPS that will be done at the DOE fueling and test facility located at the Mound site. Testing should include, but is not limited to, reliability, life, performance, pressure integrity, ambient electrical and operating temperature characteristics. The contractor shall then support the actual processing and qualification testing of the qualification SRPS at the Mound facility.

TASK 2.5.3 Mass, Thermal, Fit-Up, and Safety Simulation Models

The contractor shall design and build a mass model, a thermal model, a fit-up model, and two simulation model SRPS=s for safety testing. The mass model shall duplicate the mass and center of gravity of a flight SRPS, and shall simulate mechanical interfaces with the spacecraft. The thermal model shall be electrically heated, capable of generating the thermal output of a flight SRPS and dissipating the heat at a temperature that approximates the average external surface temperature of an operating SRPS in an outer space environment, and shall simulate mechanical interfaces with the spacecraft. The full-size fit-up model shall be sufficiently representative of the flight SRPS=s to enable fit-up and checkout of assembly and test fixtures used at DOE Mound, the spacecraft at JPL and the Radioisotope Power System shipping container. The safety simulation models will be used for impact testing at velocities that are representative of launch vehicle accident

scenarios. The models shall include representative SRPS hardware consisting of all elements that could affect the response of the General Purpose Heat source (GPHS) modules and fueled clads to an impact environment.

TASK 2.6 Interface with Government Laboratories

The contractor shall maintain interface activities with Government Laboratories and facilities concerning fuel production and processing, heat source fabrication and assembly, SRPS fueling and testing, and Stirling convertor development. The interface with the fueling and test facility shall be defined in an Interface Working Agreement (IWA) among (1) DOE Headquarters and cognizant field office, (2) the fueling and testing facility, and (3) the contractor. The IWA shall be prepared and maintained by the contractor, jointly agreed upon by the fueling and test facility and the contractor, and approved by DOE. The contractor's responsibilities and authority shall be defined in this document.

This task includes project and technical support for assembly and testing of the qualification SRPS at DOE Mound. The task includes review of tool and fixture drawings, procedures, drawing change notices, discrepancy reports, inspection reports, data packages, and test reports, as well as on-site support during assembly and testing, and attendance at walk-throughs, readiness reviews, and buy-off meetings. Preparation of Engineering Reports for the engineering and qualification SRPS's is also covered under this task.

TASK 2.7 Launch Safety Analysis and Assessment

The contractor shall perform safety analyses involving nuclear risk assessments to support NASA's National Environmental Policy Act (NEPA) requirements and the interagency nuclear safety launch approval process for each mission. During Phase II, it is anticipated that the focus of the analysis will be in support of the NEPA process and preparation of the launch approval safety analysis report. During Phase II, the contractor will be involved with and participate in the review of launch vehicle data book information which will serve as input to the NEPA and launch approval analyses. These safety analyses will address the SRPS response to blast, fragment, fire, ground/mechanical impact, and reentry environments arising from potential failures in various accident scenarios. The contractor shall perform structural and thermal analyses, as appropriate, to assess these interactions.

TASK 2.7.1 NEPA Support

The contractor shall, in support of the NEPA process for each NASA mission, perform safety analyses of the response of SRPS's to potential accidents that could occur during mission phases. Included are accidents that can occur after attachment of the SRPS to the spacecraft through the launch, Earth escape and, if appropriate, Earth swingby phases.

Definition of the launch vehicles to be considered for specific analyses will be provided by DOE.

An integrated risk analysis for input to the Outer Planets Environmental Impact Statement(s) (EISs) will be performed which quantifies the radiological risk hazards to humans resulting from the potential release, dispersion and uptake of plutonium dioxide used in the SRPS units following postulated launch accidents. This analysis will also provide estimates of potential land contamination. Launch vehicles to be considered for the integrated risk analyses are the Atlas V and Delta IV. The risk analysis will be described in a report that provides fuel release quantities (source term), health consequences, radiological health risk probabilities, and estimates of land contamination for each mission and each launch vehicle.

For both the scoping analyses and the integrated risk analysis, information on the launch vehicle configuration, trajectory, accident definition and probabilities, and characterization of the accident environments will be provided by NASA-JPL. The contractor shall attend and participate in meetings associated with the planning, preparation and completion of the materials supporting the NEPA EIS products.

TASK 2.7.2 Launch Safety Analysis and Assessment

The contractor shall, in support of the launch approval processes for each NASA mission, perform safety analyses of the overall response of the SRPS to accidents that can occur after attachment of the SRPS to the spacecraft, in the pre-launch period or during the launch through Earth escape, and if appropriate, an Earth swing-by gravity assist.

Information on the launch vehicle configuration, trajectory, accident definition and probabilities, and characterization of the accident environments will be provided by NASA-JPL.

The contractor shall develop an integrated risk analysis for each mission assessing the potential radiological hazards to man resulting from the release, dispersion, and uptake of the plutonium used in the SRPS following postulated launch accidents. This analysis will also provide estimates of potential land contamination. The integrated risk analysis will provide fuel release (source term), health consequence, radiological health risk probabilities, and estimates of land contamination for each mission. Safety analyses for the Draft and Final Safety Analysis Reports will consider a single common launch vehicle type for both missions (either an Atlas V or a Delta IV) launched from KSC/CCAFS. The contractor shall participate in meetings with DOE in development of these analyses.

The contractor shall prepare safety analysis documentation consistent with DOE and NASA requirements for each mission, consisting of a Preliminary Safety Analysis Report (PSAR), a Draft Safety Analysis Report (DSAR), and a Final Safety Analysis Report (FSAR). The contractor shall support the review of such documentation by the Interagency Nuclear Safety Review Panel (INSRP) and/or other appropriate reviewers as indicated by DOE. This includes providing information utilized in preparing the safety analysis reports

and providing assistance with analyses to be performed by INSRP for the INSRP Safety Evaluation Report.

TASK 2.7.3 Safety Test Support

The contractor shall provide support to the overall DOE safety test program. Support efforts include assisting in the definition of test requirements and safety test hardware; support of safety test operations; and analysis of safety test results. The contractor shall conduct detailed thermal, structural, and reentry analyses as required. Tests will include, but are not limited to, solid rocket motor burn tests to determine the response of GPHS components to the solid propellant fire environment. Testing may also include the design and performance of impact tests using simulated SRPS hardware at a DOE site.

These impact tests will include the acceleration of safety simulation models to TBD velocities and their impact on hard surfaces. If rocket sled tests are the chosen method of accelerating the models, the test site, rocket sled test facility, and test personnel will be provided by DOE.

TASK 2.8 Project Management

The contractor shall provide the overall management of the contracted project effort. This management function shall include all necessary activities to plan and manage the contracted and subcontracted efforts as well as to provide all necessary day-to-day interfaces and support to the project. The contractor shall provide the appropriate framework within the project to accomplish the planning function.

TASK 2.8.1 Project Management Plan

The contractor shall update the project plan provided with the proposal and shall participate in compiling a baseline or target plan with other program personnel using Primavera Project Planner® (P3). The contractor shall measure monthly performance against the DOE approved baseline plan using Primavera Project Planner®. The baseline plan will be comprised of each element of the Work Breakdown Structure (WBS) defined into specific contractor activities. Each activity will include a description of the work, the established budget, the duration of the activity, the assigned WBS code, the organizational breakdown code, and predecessor and successor activities. Schedule dates, including early start, early finish, late start, and late finish dates, shall be shown. The contractor shall update assigned activities on a monthly basis. See DOE Order 4700.1.

The contractor shall finalize the Project Management Plan submitted with the proposal. The WBS Dictionary shall be submitted separately along with the Project Management Plan.

TASK 2.8.2 Program Design Reviews

The contractor shall plan and conduct reviews required under this contract and shall provide agendas and summaries of the review meetings. The contractor shall develop a Review Plan to be included in the Project Management Plan. The Review Plan shall

provide a list of proposed reviews and a description for each review. The Review Plan shall include, but is not limited to, the following:

- C System Requirements Review
- C Preliminary Design Review
- C Final Design Review
- C Preliminary Safety Analysis Report Reviews
- C Stirling Converter Flight Readiness Review

The contractor shall prepare an agenda for each of the above listed reviews not less than 10 calendar days prior to the scheduled review. The contractor shall provide reviewers a Review Data Package not less than two weeks prior to each design review. The contractor shall document review results by means of minutes and an action item summary not more than 10 working days after the review.

TASK 2.8.3 Management Meetings

The contractor shall participate in management level project meetings held with the DOE representative at monthly intervals at the contractor's facility to review project status in terms of technical progress against schedule and cost performance, to identify DOE Project Office/Contractor interface problem areas, to review action item status and to assign new action items for resolution. When other reviews occur (such as the quarterly reviews in Germantown), they shall replace monthly project meetings. These meetings will be chaired by the contractor's Program Manager or designated alternate. Contractor support personnel shall attend as required. The contractor shall supply the agenda for these meetings subject to approval by the DOE and concurrence with NASA/JPL as appropriate. The contractor shall prepare a conference record, to include action items, for each of the meetings and distribute it within two weeks of each meeting. Informal technical interchange meetings will also be held as needed.

TASK 2.8.4 Management Information and Reporting System

The contractor shall implement and maintain a management information and reporting system that shall be consistent with DOE Contractor reporting requirements in accordance with Attachment II. The contractor shall provide a brief (typically less than three pages in length) weekly critical issues report to the DOE Program and Project Managers by 11:00 am (Eastern Time) on each Wednesday.

The contractor shall implement and maintain a commitments and agreements data base file. These files shall include commitments and agreements with DOE, other Federal agencies, laboratories, and their contractors as necessary.

The contractor shall implement and maintain an engineering data file (e.g., internal project directives, project plans, travel reports, engineering memos, analyses, test reports, problem/failure reports, drawings, presentations, hotline reports, etc.) throughout the

period of contract performance. The contractor shall update monthly the index of the file. The contractor shall make available specific file items to DOE on request.

The Contractor shall report on a monthly basis an assessment of work in progress. The Contractor shall measure and report on a monthly basis, actual program expenditures and percent complete of work performed against the approved baseline program plan using Primavera Project Planner© (P3). Actual program expenditures may be reported using software that can export cost data to P3. Reporting shall be consistent with the DOE Performance Measurement System (PMS) to an agreed-upon level of detail from the contractor's WBS. The Contractor shall prepare this monthly assessment as part of an updated current PMS plan. The Contractor shall backup their current plan, and forward the backed-up plan either by email or by overnight mail on a 3.5" HD disk to Orbital Sciences Corporation for integration into the DOE Performance Measurement System.

TASK 2.8.5 Resident Representative at Contractor Facilities

The contractor shall supply office facilities and services to accommodate one DOE on-site representative and one NASA on-site representative. Facilities are to include offices, desks, a personal computer, tables, file cabinets, phones and, copying services. The contractor shall provide unescorted badge privileges for all project activity areas to the on-site representative(s).

TASK 2.9 Quality Assurance and Reliability

TASK 2.9.1 Quality Assurance

The contractor shall develop and implement a tailored Quality Assurance Program Plan, in accordance with the Contractor Requirements Document (CRD), Attachment 1 of DOE Order 414.1A "Quality Assurance" and SDPS/PQAR-1 (Rev. 4), "Space and Defense Power Systems Programmatic Quality Assurance Requirements for Space and Terrestrial Nuclear Power Systems." The contractor shall submit the Quality Assurance Program Plan within 90 days after Phase II contract award to DOE for approval.

The contractor shall develop a Nondestructive Test (NDT) Plan to provide for nondestructive inspection of critical components. The contractor shall incorporate NDT requirements into drawings, specifications and procedures as necessary. The contractor shall submit the NDT plan to DOE for approval prior to the Final Design Review.

The contractor shall develop and maintain Quality Assurance Inspection Plans for the Phase II effort. These plans shall include:

- control of all key characteristics and process features that influence production, quality, and service life;
- control of fabrication and assembly processes that control key characteristics;
- mandatory inspection and hold points that require process verification and DOE approval before proceeding with fabrication, inspection, assembly or testing;

- inspection and testing techniques and/or instrumentation to be employed to verify acceptability;
- reference to procedures and/or other documents that establish the acceptance criteria;
- plans for maintaining records that provide evidence of acceptance; and
- data packages.

These Quality Assurance Inspection Plans shall be submitted to DOE for approval prior to the Final Design Review. After these plans are submitted, DOE will use these as a basis for identifying any mandatory inspection points.

The Configuration Management Plan and a tailored Software Management Plan based on SDPS/PQAR-1. These plans shall be submitted to DOE.

TASK 2.9.2 Reliability

The contractor shall establish, implement, and maintain a reliability program for the contract in accordance with Reliability Program Requirements for Space and Terrestrial Nuclear Power Systems, OSNP-3, with exceptions. These tasks will include Reliability in Design, Failure Modes, Effects and Criticality Analysis (FMECA), Failure Reporting documentation etc., but will not include the performance of analyses and model development as required by Section 4.4. of OSNP-3.

The contractor shall develop and submit the Reliability Program Plan within 90 days after Phase II contract award to DOE for approval. The plan will delineate the contractor's methodology for planning, establishing, implementing, documenting, and maintaining control of a formal reliability program that will result in reliable mission performance with appropriate documentation. The plan will demonstrate compliance with the requirements of those sections of OSNP-3 that will be performed during this program.

In the design efforts, the contractor shall maximize the use of materials and components that have a demonstrated successful reliability history in similar applications. The contractor shall design the SRPS=s for long-term missions with no maintenance. The contractor shall consider reliability as one of the major system parameters to be evaluated in all tradeoff studies performed for the contract.

The contractor shall prepare a system FMECA (Failure Modes, Effects and Criticality Analysis). The contractor shall evaluate all test results in support of the FMECA of the system. The contractor shall address the impact of test results on the FMECA for the system. The Contractor shall identify all credible single point failures (SPFs) and justify. Waivers must be submitted to document such SPFs.

The contractor shall establish a closed-looped failure reporting and corrective action system. Each failure will be recorded and documented as required in OSNP-3. All failures shall be reported to DOE and discussed as part of the monthly progress reports. The contractor shall list root cause and recommendations for corrective action to prevent recurrence of the failure, if applicable, as explained in OSNP-3.

3.0 PHASE III SRPS FLIGHT PROGRAM

In Phase III, the contractor will fabricate, assemble and acceptance test the flight units in support of specific missions. In addition, the contractor will conduct the safety analysis and launch support of these specific missions. For planning purposes, launches should be assumed in January 2006 and February 2007.

TASK 3.1 Flight SRPS Fabrication, Assembly and Test

The contractor shall fabricate, assemble and test TBD flight SRPSs. The total number of flight SRPSs will depend on the contractor's flight system design to meet the mission power requirements. A spare flight SRPS for each mission should also be included in the total. This shall include providing the facilities, equipment, and materials and inspecting the hardware and tooling for all SRPS parts and subassemblies. All efforts shall be done in accordance with appropriate quality procedures and requirements.

The contractor shall develop an acceptance test plan for processing and acceptance testing for each flight SRPS. Testing should include, but is not limited to, pressure integrity, ambient electrical and operating temperature characteristics. In addition, the contractor shall support processing and acceptance testing of the flight SRPSs at the DOE fueling and test facility.

TASK 3.2 Delivery and Support to DOE Mound

This task includes project and technical support for assembly and testing of SRPSs at DOE Mound. The task includes review of tool and fixture drawings, procedures, drawing change notices, discrepancy reports, inspection reports, data packages, and test reports, as well as on-site support during assembly and testing, and attendance at walk-throughs, readiness reviews, and buy-off meetings. Preparation of Engineering Reports for the flight SRPS are also covered under this task.

TASK 3.3 Launch Safety Analysis and Assessment

During this phase, the contractor shall perform the analyses and prepare the safety analysis reports in support of the interagency nuclear safety review process. The contractor shall support any remaining studies and/or activities to complete the NASA NEPA process.

TASK 3.3.1 NEPA Support

The contractor shall, in support of the NEPA process for each mission, conduct scoping analyses of the response of SRPSs to potential accidents that could occur during the launch, Earth escape and, if appropriate, Earth swingby phases of the mission. Included are accidents that can occur after attachment of the SRPS to the spacecraft through the launch, escape and, if appropriate, Earth swingby phases. Definition of the launch vehicles to be considered for specific analyses will be provided by DOE.

An integrated risk analysis for input to the Outer Planets Environmental Impact Statement(s) (EISs) will be performed which quantifies the radiological risk hazards to man resulting from the release, dispersion and uptake of the plutonium dioxide used in the flight SRPS following postulated launch accidents. This analysis will also provide estimates of potential land contamination. Launch vehicles to be considered for the integrated risk analysis are the Atlas V and Delta IV. The risk analysis will be described in a report which provides fuel release quantities (source term), health consequence, radiological health risk probabilities, and estimates of potential land contamination for each mission and each launch vehicle.

For both the scoping analyses and the integrated risk analysis, information on the launch vehicle configuration, trajectory, accident definition and probabilities, and characterization of the accident environments will be provided by NASA-JPL. The contractor shall attend and participate in meetings associated with the planning, preparation and completion of the materials supporting the NEPA EIS products.

TASK 3.3.2 Launch Safety Analysis and Assessment

The contractor shall, in support of the launch approval process for each mission, conduct analyses of the overall response of the SRPS to accidents that can occur after attachment of the SRPS to the spacecraft, in the pre-launch period or during the launch through Earth escape, and if appropriate, an Earth swing-by for this mission.

Information on the launch vehicle configuration, trajectory, accident definition and probabilities, and characterization of the accident environments will be provided by NASA-JPL.

The contractor shall develop an integrated risk analysis for each mission assessing the potential radiological hazards to man resulting from the release, dispersion, and uptake of the plutonium used in the SRPS following postulated launch accidents. This analysis will also provide estimates of potential land contamination. The integrated risk analysis will provide fuel release (source term), health consequence, radiological health risk probabilities, and estimates of land contamination for each mission. Safety analysis for the Draft and Final Safety Analysis Reports will consider the launch from a common vehicle type for both missions (either an Atlas V or a Delta IV) from KSC/CCAFS. The contractor shall participate in meetings with DOE in development of these analyses.

The contractor shall prepare safety analysis documentation consistent with DOE and NASA requirements for each mission, consisting of a Preliminary Safety Analysis Report (PSAR), a Draft Safety Analysis Report (DSAR), and a Final Safety Analysis Report (FSAR). The contractor shall support the review of such documentation by the Interagency Nuclear Safety Review Panel (INSRP) and/or other appropriate reviewers as indicated by DOE. This includes providing information utilized in preparing the safety analysis reports and providing assistance with analyses to be performed by INSRP for the INSRP Safety Evaluation Report.

TASK 3.3.3 Safety Test Support

The contractor shall provide support to the overall DOE safety test program. Support efforts shall include continued preparation and planning, and execution of impact tests that were

initiated in Phase II. In conjunction with other DOE contractors, further analytic support and modeling of propellant fire tests that were conducted during Phase II will be required. In support of these activities, the contractor may be required to conduct detailed thermal, and structural analyses and depending on the scenarios, may also be required to perform reentry analyses to determine hardware responses.

TASK 3.4 Spacecraft Integration and Liaison

The contractor shall support integration of the SRPS designs and performance parameters with the NASA/JPL spacecraft and launch vehicle by providing SRPS information and data including drawings and associated documents. The contractor shall conduct integration efforts with JPL in developing the SRPS requirements documents and interface drawings. These documents shall define the baseline needs of the NASA mission for SRPS including power, weight, size, and environments. The contractor shall provide the lead in negotiating these requirements with JPL for DOE. Once agreement is reached with JPL, the contractor will provide a recommendation to DOE for approval. The contractor shall conduct analytical studies and use test data where appropriate to assure that the SRPS is properly integrated to the NASA spacecraft and launch vehicle per the SRPS specification. The contractor shall provide support for various SRPS integration and interface meetings to assure proper integration and to provide JPL with production status, safety, technical, and launch readiness information.

TASK 3.4.1 Requirements Documents Support

The contractor shall provide engineering support including analyses related to the integration of the SRPS with the spacecraft, and other liaison activities. The contractor shall perform analyses and tradeoffs in response to questions and requests from JPL, as required and directed by DOE. The type of analyses conducted will include, as necessary, structural, mechanical, thermal, magnetic, radiation, meteoroid, and electrical performance.

TASK 3.4.2 Interface Meetings and Reviews

The contractor shall support DOE through attendance at various meetings to be held at JPL and other NASA and contractor facilities and shall work with JPL to assure that the SRPS Acceptance Test Plan provides the required data to satisfy (1) the imposed environment and testing conditions, (2) SRPS requirements, and (3) the Interface Control Drawing.

TASK 3.5 Launch Support

The contractor shall provide ground operations planning support, participate in launch facility working groups and provide representation at meetings concerning SRPS needs and characteristics as necessary for the purpose of satisfactorily accomplishing SRPS planning for delivery, storage, performance of fit-checks, spacecraft installation, launch and close-out operations. For planning purposes, the site for all launches will be KSC/CCAS. Support

shall include providing necessary personnel, attendance at meetings, home office technical support. Liaison will be established with spacecraft, launch vehicle, and launch facility personnel.

The contractor shall provide technical support to DOE Mound for the monitoring of the flight SRPS at the launch site.

TASK 3.6 Project Management

The contractor shall provide the overall management of the contracted project effort. This management function shall include all necessary activities to plan and manage the contracted and subcontracted efforts as well as to provide all necessary day-to-day interfaces and support to the project. The contractor shall provide the appropriate framework within the project to accomplish the planning function.

TASK 3.6.1 Project Management Plan

The contractor shall update the project plan finalized in Phase II as appropriate and shall update the baseline or target plan with other program personnel using Primavera Project Planner© (P3). The contractor shall measure monthly performance against the DOE approved baseline plan using Primavera Project Planner©. The baseline plan will be comprised of each element of the Work Breakdown Structure (WBS) defined into specific contractor activities. Each activity will include a description of the work, the established budget, the duration of the activity, the assigned WBS code; the organizational breakdown code; and predecessor and successor activities. Schedule dates, including early start, early finish, late start, and late finish dates, shall be shown. The contractor shall update assigned activities on a monthly basis. See DOE Order 4700.1.

The WBS Dictionary shall be submitted separately along with the Project Management Plan.

TASK 3.6.2 Program Review

The contractor shall plan and conduct reviews required under this contract and shall provide agendas and summaries of the review meetings.

The contractor shall develop a Review Plan to be included in the Project Management Plan. The Review Plan shall provide a list of proposed reviews and a description for each review. The Review Plan shall include, but is not limited to, the following:

1. Final Safety Analysis Report Reviews
2. SRPS Acceptance Test Review
3. Shipment Readiness Review

The contractor shall prepare an agenda for each of the above listed reviews not less than 10 calendar days prior to the scheduled review. The contractor shall provide reviewers a Review Data Package not less than two weeks prior to each design review. The contractor

shall document review results by means of minutes and action item summary not more than 10 working days after the review.

The contractor shall participate in management level project meetings held with the DOE representative at monthly intervals at the contractor's facility to review project status in terms of technical progress against schedule and cost performance, to identify DOE Project Office/Contractor interface problem areas, to review action item status and to assign new action items for resolution. When other reviews occur (such as the quarterly reviews in Germantown), they shall replace monthly project meetings. These meetings will be chaired by the contractor's Program Manager or designated alternate. Contractor support personnel shall attend as required. The contractor shall supply the agenda for these meetings subject to approval by the DOE. The contractor shall prepare a conference record, to include action items, for each of the meetings and distribute it within two weeks of each meeting. Informal technical interchange meetings will also be held as needed.

TASK 3.6.3 Management Information and Reporting System

The contractor shall implement and maintain a management information and reporting system which shall be consistent with DOE contractor reporting requirements. The contractor shall provide a brief (typically less than three pages in length) weekly critical activities report to the DOE Program and Project Managers by 11:00 am (Eastern Time) on each Wednesday.

The contractor shall implement and maintain a commitments and agreements data base file. These files shall include commitments and agreements with DOE, other Federal agencies, laboratories, and their contractors as necessary.

The contractor shall implement and maintain an engineering data file (e.g., internal project directives, project plans, travel reports, engineering memos, analyses, test reports, problem/failure reports, drawings, presentations, hotline reports, etc.) throughout the period of contract performance. The contractor shall update monthly the index of the file. The contractor shall make available specific file items to DOE on request.

The Contractor shall report on a monthly basis an assessment of work in progress. The Contractor shall measure and report on a monthly basis, actual program expenditures and percent complete of work performed against the approved baseline program plan using Primavera Project Planner© (P3). Actual program expenditures may be reported using software that can export cost data to P3. Reporting shall be consistent with the DOE Performance Measurement System (PMS) to an agreed-upon level of detail from the contractor's WBS. The Contractor shall prepare this monthly assessment as part of an updated current PMS plan. The Contractor shall backup their current plan, and forward the backed-up plan either by email or by overnight mail on a 3.5" HD disk to Orbital Sciences Corporation for integration into the DOE Performance Measurement System.

TASK 3.7 Quality Assurance

The contractor shall update the Quality Assurance Program Plan developed in Phase II as appropriate. The Quality Assurance Program Plan shall be implemented in accordance with the Contractor Requirements Document (CRD), Attachment 1 of DOE Order 414.1A "Quality Assurance" and SDPS/PQAR-1 (Rev. 4), "Space and Defense Power Systems Programmatic Quality Assurance Requirements for Space and Terrestrial Nuclear Power Systems." The updated Quality Assurance Program Plan shall be submitted to DOE for approval.

The contractor shall update Nondestructive Test (NDT) Plan prepared in Phase II as appropriate. The contractor shall incorporate NDT requirements into drawings, specifications and procedures as necessary. The contractor shall submit updates to the NDT plan to DOE for approval prior to the Final Design Review.

The contractor shall develop and maintain Quality Assurance Inspection Plans for the Phase III effort. These plans shall include:

- control of all key characteristics and process features that influence production, quality, and service life;
- control of fabrication and assembly processes that control key characteristics;
- mandatory inspection and hold points that require process verification and DOE approval before proceeding with fabrication, inspection, assembly or testing;
- inspection and testing techniques and/or instrumentation to be employed to verify acceptability;
- reference to procedures and/or other documents that establish the acceptance criteria;
- plans for maintaining records that provide evidence of acceptance; and
- data packages.

These Quality Assurance Inspection Plans shall be submitted to DOE for approval prior to the Final Design Review. After these plans are submitted, DOE will use these as a basis for identifying any mandatory inspection points.

The Configuration Management Plan and a tailored Software Management Plan based on SDPS/PQAR-1. These plans shall be submitted to DOE.

TASK 3.8 Reliability

The contractor shall update the reliability program established in Phase II as appropriate. The reliability program shall be established, implemented, and maintained in accordance with Reliability Program Requirements for Space and Terrestrial Nuclear Power Systems, OSNP-3, with exceptions. These tasks will include Reliability in Design, Failure Modes, Effects and Criticality Analysis (FMECA), Failure Reporting documentation etc., but will not

include the performance of analyses and model development as required by Section 4.4. of OSNP-3. The contractor shall submit the updated Reliability Program Plan to DOE for approval.

The plan will delineate the contractor's methodology for planning, establishing, implementing, documenting, and maintaining control of a formal reliability program that will result in reliable mission performance with appropriate documentation. The plan will demonstrate compliance with the requirements of those sections of OSNP-3 that will be performed during this program.

In the design efforts, the contractor shall maximize the use of materials and components that have a demonstrated successful reliability history in similar applications. The contractor shall design the SRPS=s for long-term missions with no maintenance. The contractor shall consider reliability as one of the major system parameters to be evaluated in all tradeoff studies performed for the contract.

The contractor shall establish a closed-looped failure reporting and corrective action system. Each failure will be recorded and documented as required in OSNP-3. All failures shall be reported to DOE and discussed as part of the monthly progress reports. The contractor shall list root cause and recommendations for corrective action to prevent recurrence of the failure, if applicable, as explained in OSNP-3.

TASK 3.9 Resident Representative at Contractor Facilities

The contractor shall supply office facilities and services to accommodate one DOE on-site representative and one NASA on-site representative. Facilities are to include offices, desks, tables, files, phones, copying, and secretarial services. The contractor shall provide unescorted badge privileges for all project activity areas to the on-site representative(s).

DOE F 1332.1

(04-89)

All other editions

obsolete

U.S. DEPARTMENT OF ENERGY
REPORTING REQUIREMENTS CHECKLIST

1. PROGRAM/PROJECT TITLE System Integration of Stirling Radioisotope Power system (SRPS) - Phase I		2. IDENTIFICATION NUMBER DE-RP03-00SF22042	
3. PARTICIPANT NAME AND ADDRESS TBD			
4. PLANNING AND REPORTING REQUIREMENTS			
A. General Management <input type="checkbox"/> Management Plan <input type="checkbox"/> Status Report <input type="checkbox"/> Summary Report B. Schedule/Labor/Cost <input type="checkbox"/> Milestone Schedule/Plan <input type="checkbox"/> Labor Plan <input type="checkbox"/> Facilities Capital Cost of Money Factors Computation <input type="checkbox"/> Contract Facilities Capital and Cost of Money Cost Plan <input type="checkbox"/> Milestone Schedule/Status <input type="checkbox"/> Labor Management Report <input type="checkbox"/> Cost Management Report c. Exception Reports <input type="checkbox"/> Conference Record <input type="checkbox"/> Hot Line Report D. Performance Measurement <input type="checkbox"/> Management Control System Description <input type="checkbox"/> WBS Dictionary <input type="checkbox"/> Index <input type="checkbox"/> Element Definition <input type="checkbox"/> Cost Performance Reports <input type="checkbox"/> Format 1 - WBS <input type="checkbox"/> Format 2 - Function <input type="checkbox"/> Format 3 - Baseline	Frequency	E. Financial Incentives <input type="checkbox"/> Statement of Income and Expense <input type="checkbox"/> Balance Sheet <input type="checkbox"/> Cash Flow Statement <input type="checkbox"/> Statement of Changes in Financial Position <input type="checkbox"/> Loan Drawdown Report <input type="checkbox"/> Operating Budget <input type="checkbox"/> Supplementary Information F. Technical <input type="checkbox"/> Notice of Energy RD&D Project (Required with any of the following) <input type="checkbox"/> Technical Progress Report <input type="checkbox"/> Draft for Review <input type="checkbox"/> Final for Approval <input type="checkbox"/> Topical Report <input type="checkbox"/> Final Technical Report <input type="checkbox"/> Draft for Review <input type="checkbox"/> Final for Approval <input type="checkbox"/> Software <input checked="" type="checkbox"/> Other (Specify) 1. Oral Progress Report (Midway to Completion) 2. Oral Summary Report (Completion) 3. Conceptual Design Summary Report	Frequency
5. FREQUENCY CODES <div style="display: flex; justify-content: space-between;"> <div> A - As Required C - Change to Contractual Agreement F - Final (end of effort) </div> <div> M - Monthly O - Once After Award Q - Quarterly </div> <div> S - Semi-Annually X - With Proposal/Bid/Application or with Significant Changes Y - Yearly or Upon Renewal of Contractual Agreement </div> </div>			
6. SPECIAL INSTRUCTIONS (ATTACHMENTS) <div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> Report Distribution List/Addressees <input type="checkbox"/> Reporting Elements <input type="checkbox"/> Due Dates </div> <div> <input type="checkbox"/> Analysis Thresholds <input type="checkbox"/> Work Breakdown Structure <input type="checkbox"/> Other (see attached) </div> </div>			
7. PREPARED BY (SIGNATURE AND DATE)		8. REVIEWED BY (SIGNATURE AND DATE)	

REPORTING REQUIREMENTS CHECKLIST

PURPOSE

The checklist identifies and communicates additional reporting requirements which are not otherwise set forth in DOE contractual agreement. It will be included as part of the contractual agreements. The checklist will be completed for each contract or financial incentives agreement. If necessary, special instructions may be appended to modify the checklist to adapt it to specific situations.

INSTRUCTIONS

Item 1. Enter the title of the project as indicated in the procurement request, contract, interagency agreement, initiating memorandum, or official award, as appropriate.

Item 2. Enter the identification number of the procurement request, contract award, or financial incentives agreement, as appropriate.

Item 3. Enter the name and address of the participant.

Item 4. Check spaces to indicate plans and reports selected. For each reporting requirement selected, indicate the frequency of delivery using one of the frequency codes from Item 5. The addressees to whom reports will be sent and the total number of copies required will be referenced in an attached coded distribution list.

Note: Frequency codes represent specific reporting frequencies for each selected report. The frequencies are recommended in the solicitation and negotiated prior to award. The number of copies required and the addressees are similarly finalized prior to award.

Item 5. This item lists the possible frequency codes to be applied in the selection of reporting requirements.

Item 6. Attach special instructions as necessary. Check the appropriate box(es).

Item 7. Signature of person preparing checklist and the date prepared.

Item 8. Signature of person reviewing the checklist and date reviewed.

REPORTING REQUIREMENTS CHECKLIST

Item 6. SPECIAL INSTRUCTIONS

1. Phase I

- 1.1 The attached Phase I Report Distribution List specifies the various reports/plans required, the address codes to which they must be delivered, and the total number of copies required.
- 1.2 The attached Phase I Report Distribution List provides program/technical documents required by the Statement of Work.

PHASE I REPORT DISTRIBUTION LIST

<i>Report/Plan</i>	<i>Form #</i>	<i>No. of Copies</i>	<i>Addressees</i>
Preliminary Conceptual Design Review	None	3,1,1,1,1 (Presentation Notes)	A, B, C, D, E
Final Conceptual Design Review	None	3,1,1,1,1 (Presentation Notes)	A, B, C, D, E
Conceptual Design Summary Report and Phases II/III Proposal	None	3,1,1,1,1	A, B, C, D, E

REPORT ADDRESSEES

- A. U.S. Department of Energy
Space and Defense Power Systems (NE-50)
19901 Germantown Road
Germantown, MD 20874
ATTN: Richard Furlong
Richard.Furlong@hq.doe.gov

- B. NASA Glenn Research Center
Power & On Board Propulsion Technology Division
Mail Stop 301-2
21000 Brookpark Road
Cleveland, OH 44135
ATTN: Richard K Shaltens
Richard.K.Shaltens@OAK.doe.gov

- C. U.S. Department of Energy
Oakland Operations Office
1301 Clay Street, Room 700N
Oakland, CA 94612-5208
ATTN: Kim Efishoff
Kim.Efishoff@oak.doe.gov

- D. U.S. Department of Energy
Oakland Operations Office
1301 Clay Street, Room 700N
Oakland, CA 94612-5208
ATTN: Wayne Bryan, CAPD
Wayne.bryan@oak.doe.gov

- E. U.S. DOE Miamisburg Area Office
P.O. Box 66
Miamisburg, OH 45343-0066
ATTN: Tim Frazier
tim.frazier@em.doe.gov

U.S. DEPARTMENT OF ENERGY REPORTING REQUIREMENTS CHECKLIST

1. PROGRAM/PROJECT TITLE System Integration of Stirling Radioisotope Power System (SRPS) - Phases II & III		2. IDENTIFICATION NUMBER DE-RP03-00SF22042	
3. PARTICIPANT NAME AND ADDRESS TBD			
4. PLANNING AND REPORTING REQUIREMENTS			
A. General Management		E. Financial Incentives	
<div><div><input checked="" type="checkbox"/></div>Management Plan</div> <div><div><input checked="" type="checkbox"/></div>Status Report</div> <div><div><input checked="" type="checkbox"/></div>Summary Report</div>	Frequency X, O, C M M	<div><div><input type="checkbox"/></div>Statement of Income and Expense</div> <div><div><input type="checkbox"/></div>Balance Sheet</div> <div><div><input type="checkbox"/></div>Cash Flow Statement</div> <div><div><input type="checkbox"/></div>Statement of Changes in Financial Position</div>	Frequency
B. Schedule/Labor/Cost			
<div><div><input checked="" type="checkbox"/></div>Milestone Schedule/Plan</div> <div><div><input type="checkbox"/></div>Labor Plan</div> <div><div><input type="checkbox"/></div>Facilities Capital Cost of Money Factors Computation</div> <div><div><input type="checkbox"/></div>Contract Facilities Capital and Cost of Money</div> <div><div><input checked="" type="checkbox"/></div>Cost Plan</div> <div><div><input checked="" type="checkbox"/></div>Milestone Schedule/Status</div> <div><div><input type="checkbox"/></div>Labor Management Report</div> <div><div><input checked="" type="checkbox"/></div>Cost Management Report</div>	X, O, C X, O, C, Y M M	<div><div><input type="checkbox"/></div>Loan Drawdown Report</div> <div><div><input type="checkbox"/></div>Operating Budget</div> <div><div><input type="checkbox"/></div>Supplementary Information</div>	
c. Exception Reports		F. Technical	
<div><div><input checked="" type="checkbox"/></div>Conference Record</div> <div><div><input type="checkbox"/></div>Hot Line Report</div>	A	<div><div><input type="checkbox"/></div>Notice of Energy RD&D Project (Required with any of the following)</div> <div><div><input checked="" type="checkbox"/></div>Technical Progress Report</div> <div><div><input type="checkbox"/></div>Draft for Review</div> <div><div><input type="checkbox"/></div>Final for Approval</div>	M,Y
D. Performance Measurement			
<div><div><input type="checkbox"/></div>Management Control System Description</div> <div><div><input checked="" type="checkbox"/></div>WBS Dictionary</div> <div><div><input checked="" type="checkbox"/></div>Index</div> <div><div><input checked="" type="checkbox"/></div>Element Definition</div> <div><div><input checked="" type="checkbox"/></div>Cost Performance Reports</div> <div><div><input checked="" type="checkbox"/></div>Format 1 - WBS</div> <div><div><input checked="" type="checkbox"/></div>Format 2 - Function</div> <div><div><input type="checkbox"/></div>Format 3 - Baseline</div>	X, O, C O, C M M	<div><div><input type="checkbox"/></div>Topical Report</div> <div><div><input checked="" type="checkbox"/></div>Final Technical Report</div> <div><div><input type="checkbox"/></div>Draft for Review</div> <div><div><input type="checkbox"/></div>Final for Approval</div> <div><div><input type="checkbox"/></div>Software</div> <div><div><input checked="" type="checkbox"/></div>Other (Specify) <u>See attached</u></div>	F
5. FREQUENCY CODES			
A - As Required C - Change to Contractual Agreement		M - Monthly O - Once After Award S - Semi-Annually X - With Proposal/Bid/Application or with Significant Changes	
E - Final (end of effort)		Y - Yearly or Upon Renewal of Contractual Agreement	
6. SPECIAL INSTRUCTIONS (ATTACHMENTS)			
<div><div><input checked="" type="checkbox"/></div>Report Distribution List/Addressees</div> <div><div><input type="checkbox"/></div>Reporting Elements</div> <div><div><input type="checkbox"/></div>Due Dates</div>	Q - Quarterly	<div><div><input type="checkbox"/></div>Analysis Thresholds</div> <div><div><input type="checkbox"/></div>Work Breakdown Structure</div> <div><div><input checked="" type="checkbox"/></div>Other (see attached)</div>	
7. PREPARED BY (SIGNATURE AND DATE)		8. REVIEWED BY (SIGNATURE AND DATE)	

REPORTING REQUIREMENTS CHECKLIST**PURPOSE**

The checklist identifies and communicates additional reporting requirements which are not otherwise set forth in DOE contractual agreement. It will be included as part of the contractual agreements. The checklist will be completed for each contract or financial incentives agreement. If necessary, special instructions may be appended to modify the checklist to adapt it to specific situations.

INSTRUCTIONS

Item 1. Enter the title of the project as indicated in the procurement request, contract, interagency agreement, initiating memorandum, or official award, as appropriate.

Note: Frequency codes represent specific reporting frequencies for each selected report. The frequencies are recommended in the solicitation and negotiated prior to award. The number of copies required and the addressees are similarly finalized prior to award.

Item 2. Enter the identification number of the procurement request, contract award, or financial incentives agreement, as appropriate.

Item 5. This item lists the possible frequency codes to be applied in the selection of reporting requirements.

Item 3. Enter the name and address of the participant.

Item 6. Attach special instructions as necessary. Check the appropriate box(es).

Item 4. Check spaces to indicate plans and reports selected. For each reporting requirement selected, indicate the frequency of delivery using one of the frequency codes from Item 5. The addressees to whom reports will be sent and the total number of copies required will be referenced in an attached coded distribution list.

Item 7. Signature of person preparing checklist and the date prepared.

Item 8. Signature of person reviewing the checklist and date reviewed.

REPORTING REQUIREMENTS CHECKLIST (Cont'd)Item 6. SPECIAL INSTRUCTIONS

1. Phase II, Phase III

2.1 Schedule for delivery of Phase II/III reports:

Frequency:

A (As Required)

Due Dates:

Within 5 calendar days after the event initiating the report for the Conference Record of Hot Line Report and within 30 days for all other.

C (At contract change)

Within 30 calendar days after negotiated change.

F (Final Report)

Within 45 calendar days after end of study effort, requires Contracting Officer's approval.

M (Monthly)

By the 19th calendar day of the following month.

O (At contract award)

Within 30 calendar days after contract award.

Q (Quarterly)

Within 15 calendar days after end of calendar quarter or portion thereof.

S (Semiannually)

Within 20 calendar days after end of Government fiscal half year.

Y (Yearly)

Within 20 calendar days after end of the Government fiscal year or upon contract renewal.

X (With proposal)

With Proposal.

Weekly

By 11:00 am on each Wednesday by e-mail.

6. SPECIAL INSTRUCTIONS (Continued)

- 2.2 The attached Phase II/III Report Distribution List specifies the various reports/plans required, the address codes to which they must be delivered, and the total number of copies required.
- 2.3 The subcontracting quarterly report SF-294 "Subcontracting Report for Individual Contracts" should not be confused with the "Subcontracting Plan" called out in the SOW. This report requires distribution as shown below:

**U.S. Department of Energy
Oakland Operations Office
1301 Clay Street, Room 700N
Oakland, CA 94612
Attn: Wayne Bryan, Contracting Officer**

- 2.4 Monthly Status Report shall also address Safety, Reliability, and Quality Assurance and Environmental issues.
- 2.5 The attached Phase II/III Contract Data Requirements List (CDRL) lists the program/technical documents required by the Statement of Work. The CDRL shows the required DOE approvals, frequency of issue, and dates due.

PHASE II/III REPORT DISTRIBUTION LIST

Report/Plan	Form #	No. of Copies	Addressees
Project Management Plan	None	3,1,1,1,1,1,1	A, B, C, D, E, F, G
PMS Project Status Report	None	3,1,1,1,1	A, B, C, D, E
Annual Project Status Report	None	3,1,1,1,1	A, B, C, D, E
Project Final Summary Report	Att. II.a *	3,1,1,1,1,1,1	A, B, C, D, E, F, G
Government Property Report	Att. II.a *	1,1	C, D
Milestone Schedule Plan	Att. II.a *	3,1,1,1,1	A, B, C, D, E
Cost Plan	Att. II.a *	3,1,1,1	A, B, C, D
Milestone Schedule Status	Att. II.a *	3,1,1	A, B, C
Cost Management Report	Att. II.a *	3,1,1	A, B, C
Conference Record	None	3,1	A, C
WBS Dictionary Index	Att. II.a *	3,1,1	A, B, C
WBS Dictionary Element Dictionary	Att. II.a *	3,1,1	A, B, C
Cost Performance Reports:			
Format 1 - WBS	Att. II.a *	3,1,1	A, B, C
Format 2 - Function	Att. II.a *	3,1,1	A, B, C
Weekly Technical Progress	None	1,1,1	A, B, C
Monthly Technical Progress	None	3,1,1	A, B, C
Annual Technical Progress	None	3,1,1,1,1,1,1	A, B, C, D, E, F, G
Final Technical Report	None	3,1,1,1,1,1,1	A, B, C, D, E, F, G
Preliminary Design Report	None	3,1,1,1,1	A, B, C, D, E
Final Design Report	None	3,1,1,1,1	A, B, C, D, E
Flight Technical Readiness Review	None	3,1,1,1,1	A, B, C, D, E
Controller Readiness Review	None	3,1,1,1,1	A, B, C, D, E
Subcontract Report for Individual Contracts	SF-294	1,1	C, D
Summary Subcontract Report	SF-295	3,1,1,1	A, B, C, D

* Attachment II.a, Uniform Reporting System for Contractors

CDRL AND REPORT ADDRESSEES

- A. U.S. Department of Energy
Space and Defense Power Systems (NE-50)
19901 Germantown Road
Germantown, MD 20874
ATTN: Richard Furlong
Richard.Furlong@hq.doe.gov
- B. NASA Glenn Research Center
Power & On Board Propulsion Technology Division
Mail Stop 301-2
21000 Brookpark Road
Cleveland, OH 44135
ATTN: Richard K Shaltens
Richard.K.Shaltens@OAK.doe.gov
ATTN: Jeffery G. Schreiber
Jeffrey.g.schreiber@GRC.nasa.gov
- C. U.S. Department of Energy
Oakland Operations Office
1301 Clay Street, Room 700N
Oakland, CA 94612-5208
ATTN: Kim Efishoff
Kim.Efishoff@oak.doe.gov
- D. U.S. Department of Energy
Oakland Operations Office
1301 Clay Street, Room 700N
Oakland, CA 94612-5208
ATTN: Wayne Bryan, CAPD
Wayne.bryan@oak.doe.gov
- E. U.S. DOE Miamisburg Area Office
P.O. Box 66
Miamisburg, OH 45343-0066
ATTN: Tim Frazier
tim.frazier@em.doe.gov

CDRL AND REPORT ADDRESSEES

- F. Jet Propulsion Laboratory
800 Oak Grove Drive
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CONTRACTOR DATA REQUIREMENTS LIST (CDRL)

SECTION A - MANAGEMENT DATA

CDRL NUMBER	TITLE	DESCRIPTION	COPIES REQUIRED (EST.)	FREQUENCY	DUE DATE	ADDRESSEES
A.01	REQUEST FOR PUBLICATIONS AND/OR ABSTRACTS AND PAPERS	WHERE THE CONTRACTOR OR ITS EMPLOYEES DESIRE TO PUBLISH INFORMATION REGARDING SCIENTIFIC OR TECHNICAL DEVELOPMENTS MADE OR CONCEIVED IN THE COURSE OF OR UNDER THIS CONTRACT, SUCH INFORMATION MUST BE SUBMITTED TO DOE FOR PATENT APPROVAL PRIOR TO RELEASE OR PUBLICATION.	3,1	WHERE APPLICABLE	AS REQUIRED	A, C
A.02	CURRENT PROJECT PMS PLAN (WITH DISK)	PROVIDES A CONTRACT BASELINE PLAN CONSISTENT WITH THE DOE PROJECT MANAGEMENT SYSTEM TO AN AGREED-UPON LEVEL OF DETAIL FROM THE CONTRACTOR'S DETAILED WORK BREAKDOWN STRUCTURE.	3,1,1	ONCE	WITHIN 3 MONTHS OF CONTRACT DEFINITIZATION	A, B, C
A.03	QUALITY ASSURANCE PROGRAM PLAN	DESCRIBES GENERAL REQUIREMENTS FOR MANAGING, PLANNING, CONDUCTING, AND EVALUATING A QUALITY ASSURANCE PROGRAM.	3,1,1,1,1	ONCE	WITHIN 3 MONTHS OF CONTRACT AWARD	A, B, C, D, E
A.04	CONFIGURATION MANAGEMENT PLAN	DESCRIBES GENERAL REQUIREMENTS FOR MANAGING, PLANNING, CONDUCTING, AND EVALUATING A CONFIGURATION MANAGEMENT PROGRAM.	3,1,1	ONCE	WITHIN 3 MONTHS OF CONTRACT AWARD	A, B, C
A.05	INTERFACE WORKING AGREEMENT (IWA)	INTERFACE ACTIVITIES WITH GOVERNMENT LABORATORIES, TO INCLUDE CONTRACTOR RESPONSIBILITIES AND AUTHORITY.	3,1,1, 1	ONCE	AS REQUIRED	A, C, D, E
A.06	QUALIFICATION TEST PLAN	DESCRIBES TEST ACTIVITIES TO BE PERFORMED TO QUALIFY THE SRPS DESIGN.	3, 1,1,1,1	ONCE	PRIOR TO INITIATING QUALIFICATION TESTS	A, B, C, D, E

A.07	PRELIMINARY SAFETY PLAN	DESCRIBES SPECIFIC SAFETY TESTS AND REQUIRED SAFETY TEST HARDWARE	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.08	ACCEPTANCE TEST PLAN	SRPS ATP PROVIDES DATA TO SATISFY (1) THE IMPOSED ENVIRONMENT AND TESTING CONDITIONS (2) SRPS REQUIREMENTS, AND (3) INTERFACE CONTROL DRAWING.	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.09	ELECTRICAL CONTROLLER SPECIFICATION	BASED ON THE PRELIMINARY CONTROLLER SPECIFICATION DEVELOPED IN PHASE I, FINALIZE AND ISSUE CONTROLLER SPECIFICATION IN COORDINATION WITH CONTROLLER SUPPLIER.	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.10	PRELIMINARY SAFETY ANALYSIS REPORT (PSAR)	NECESSARY IN SUPPORT OF INSRP REVIEW.	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.11	DRAFT FINAL SAFETY ANALYSIS REPORT (DFSAR)	NECESSARY IN SUPPORT OF INSRP REVIEW.	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.12	FINAL SAFETY ANALYSIS REPORT (FSAR)	NECESSARY IN SUPPORT OF INSRP REVIEW.	3,1,1,1	ONCE PER MISSION	AS REQUIRED	A, B, C, E
A.13	SRPS REQUIREMENTS DOCUMENTATION	DESCRIBES SRPS INTERFACE, PERFORMANCE, AND ENVIRONMENTAL REQUIREMENTS WITH NASA.	3,1,1,1,1,1	ONCE	AS REQUIRED	A, B, C, D, E, F, G
A.14	REVIEW PLAN	INCLUDED AS PART OF THE PROJECT MANAGEMENT PLAN.	3,1,1	ONCE PER REVIEW	AS REQUIRED	A, B, C
A.15	REVIEW REPORTING AGENDA	ADDRESSES AGENDA FOR REVIEWS LISTED IN SOW.	E-MAIL	ONCE PER REVIEW	30 CALENDAR DAYS PRIOR TO SCHEDULED REVIEW.	A, B, C
A.16	PROJECT MEETING AGENDA/ PROJECT MEETING MINUTES	DESCRIBES MONTHLY MANAGEMENT LEVEL PROJECT MEETINGS WITH DOE TO INCLUDE AGENDA AND MINUTES.	E-MAIL	MONTHLY	MINUTES DUE WITHIN ONE WEEK OF EACH MEETING.	A, B, C
A.17	NONDESTRUCTIVE TEST (NDT) PLAN	NECESSARY TO PROVIDE FOR NONDESTRUCTIVE INSPECTION OF CRITICAL COMPONENTS.	3,1,1,1,1,1	ONCE	AS REQUIRED	A, B, C, E, F, G

A.18	QUALITY ASSURANCE INSPECTION AND TEST PLAN	DESCRIBES CHARACTERISTICS, METHODS, AND ACCEPTANCE CRITERIA, PLUS RECORDING OF OBJECTIVE EVIDENCE OF INSPECTION RESULTS.	3,1,1,1	ONCE	BEFORE PROCEEDING BEYOND DOE ESTABLISHED HOLD POINTS.	A, B, C, E
A.19	RELIABILITY PROGRAM PLAN	DESCRIBES CONTRACTOR RELIABILITY PROGRAM WHICH WILL RESULT IN RELIABLE MISSION PERFORMANCE.	3,1,1	ONCE	WITHIN 90 DAYS AFTER CONTRACT AWARD	A, B, C
A.20	FAILURE MODES, EFFECTS, AND CRITICALITY ANALYSIS (FMECA)	DESCRIBES EVALUATION OF ALL TEST RESULTS IN SUPPORT OF RELIABILITY ASSESSMENT OF SYSTEM.	3,1,1	ONCE	AS REQUIRED	A, B, C, E
A.21	SOFTWARE MANAGEMENT PLAN	IN ACCORDANCE WITH SNSP/PQAR-1.	1,1,1	ONCE	AS REQUIRED	A, B, C
A.22	CLASS I CHANGES TO SPECIFICATIONS AND DRAWINGS	IN ACCORDANCE WITH DOE ORDER 414.1A, QUALITY ASSURANCE.	3,1,1,1	ONCE PER CHANGE	AS REQUIRED	A, B, C, E
A.23	CLASS I Non- CONFORMANCE REPORTS	IN ACCORDANCE WITH DOE ORDER 414.1A, QUALITY ASSURANCE.	3,1,1,1	AS REQUIRED	AS REQUIRED	A, B, C, E

CONTRACTOR DATA REQUIREMENTS LIST (CDRL)

SECTION B - PRODUCTION DEFINITION

CDRL NUMBER	TITLE	DESCRIPTION	COPIES REQUIRED (EST.)	FREQUENCY	DUE DATE	ADDRESSEES
B.01	PRELIMINARY DESIGN	BASED ON THE APPROVED PHASE I CONCEPTUAL DESIGN. THE CONTRACTOR SHALL PREPARE A PRELIMINARY DESIGN REVIEW PACKAGE A THE COMPLETION OF THE PRELIMINARY DESIGN.	3,1,1,1,1,1	ONCE	AS REQUIRED	A, B, C, E, F, G
B.02	FINAL DESIGN	BASED ON THE APPROVED PRELIMINARY DESIGN. THE CONTRACTOR SHALL PREPARE A FINAL DESIGN REVIEW PACKAGE A THE COMPLETION OF THE FINAL DESIGN.	3,1,1,1,1,1	ONCE	AS REQUIRED	A, B, C, E, F, G
B.03	ENGINEERING LINE AND BOOK FORM DRAWINGS AND SPECIFICATIONS	BASIC RELEASE OF DRAWINGS AND CHANGES RELATED TO THE SRPS USING ESTABLISHED FORMAT AND CONTENT OF THE CONTRACTOR FOR MANUFACTURING/ENGINEERING/QUALITY PROCESSES, PROCEDURES, AND SPECIFICATIONS.	3,1,1,1	ONCE PER CHANGE	AS REQUIRED	A, B, C, E
B.04	ENVIRONMENTAL CRITERIA AND TEST REQUIREMENTS DOCUMENTS	REQUIREMENTS FOR POTENTIAL NASA MISSIONS.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.05	QUALIFICATION REPORT	INDICATES SPECIFIC REQUIREMENTS THAT SRPS IS QUALIFIED FOR POTENTIAL NASA MISSIONS.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.06	SRPS PROCESSING PLANS AND PROCEDURES	MANUFACTURING AND TESTING PROCEDURES. SUBMIT AS PART OF THE DESIGN PACKAGE.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.07	DETAILED FUELING AND TEST PLANS	PROCEDURES AND PLANS, NECESSARY FOR SRPS FUELING AND TESTING AT MOUND.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E

CDRL NUMBER	TITLE	DESCRIPTION	COPIES REQUIRED (EST.)	FREQUENCY	DUE DATE	ADDRESSEES
B.08	SRPS HANDLING AND OPERATING PROCEDURES	SUBMIT AS PART OF FINAL DESIGN PACKAGE.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.09	ELECTRICALLY HEATED SRPS ACCEPTANCE TEST PLAN	DESCRIBES TEST ACTIVITIES TO EVALUATE ACCEPTABILITY OF ELECTRICALLY HEATED SRPS.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.10	QUALIFICATION UNIT ELECTRICALLY HEATED SRPS Log Book	DOCUMENTATION OF FABRICATION, MANUFACTURING, AND TESTING EFFORTS OF QUALIFICATION ELECTRICALLY HEATED SRPS's.	3,1,1,1	AS REQUIRED	AS REQUIRED	A, B, C, E
B.11	QUALIFICATION UNIT DATA PACKAGE	DOCUMENTATION REQUIRED FOR THE QUALIFICATION UNIT.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E
B.12	PROTOFLIGHT UNIT ELECTRICALLY HEATED SRPS Log Book	DOCUMENTATION OF FABRICATION, MANUFACTURING, AND TESTING EFFORTS OF PROTOFLIGHT ELECTRICALLY HEATED SRPS.	3,1,1,1	AS REQUIRED	AS REQUIRED	A, B, C, E
B.13	PROTOFLIGHT UNIT DATA PACKAGE	DOCUMENTATION REQUIRED FOR THE PROTOFLIGHT UNIT.	3,1,1,1	ONCE	AS REQUIRED	A, B, C, E